# U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

## Scientific Name:

Dichanthelium hirstii

## Common Name:

Hirst Brothers' Panic grass

## Lead region:

Region 5 (Northeast Region)

## Information current as of:

05/19/2011

## Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

___ Taxon is more abundant or widespread than previously believed or not subject

___ Taxon not subject to the degree of threats sufficient to warrant issuance of

___ Range is no longer a U.S. territory

___ Insufficient information exists on biological vulnerability and threats to s

___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats

## Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

**For Petitioned Candidate species:**

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

## Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Delaware, Georgia, New Jersey, North Carolina
- **US Counties**:County information not available
- **Countries**:Country information not available

## Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Delaware, New Jersey, North Carolina
- **US Counties**: Atlantic, NJ, Burlington, NJ
- **Countries**:Country information not available

## Land Ownership:

Both North Carolina populations occur on federal lands. The Delaware population occurs on Assawoman Pond, a State-owned Wildlife Management Area. One New Jersey population occurs on land owned by The Nature Conservancy (TNC) and a second population occurs on State-owned land (Wharton State Forest).

## Lead Region Contact:

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## Lead Field Office Contact:

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# Biological Information

## Species Description:

*Dichanthelium hirstii*, a perennial grass, produces erect leafy flowering stems from May to October. These stems may develop from over-wintering rosettes (a cluster of leaves or other organs arranged in a circle or disk, often at the base of the plant) or from nodes of stems remaining from the previous year (Schuyler 1998a, p. 1). The culms (the aerial stem of a grass or sedge) are 55 - 80 centimeters (cm) (21.7 – 31.5 inches (in) tall with flat leaf blades that are stiffly erect or narrowly ascending, without hairs, green often tinged with purple, and 4.5 - 11 cm (1.8 – 4.3 in) long and 3 - 5.5 millimeters (mm) (0.12 – 0.22 in) wide. The 1.8 – 2.1 mm (0.07 – 0.08 in) long flowers (spikelets) are produced terminally on a narrowly branched inflorescence (flower cluster on a plant that blooms from the base upwards, usually broadest near the base and tapering upwards) along the stem (called a panicle), that is from 4.5 – 9 cm (1.8 – 3.5 in) long and about 5 mm (0.20 in) wide with branches as much as 2.5 cm (1.0 in) long (Swallen 1961, p. 236).

Toward the middle or latter part of the growing season, leafy rosettes develop from the basal (bottom or base) parts of existing plants. Also during this time, seeds germinate and produce leafy rosettes (Schuyler 1998a, p. 1). Seeds presumably persist in seed banks (Schuyler 1998a, p. 1) similar to those of related species (e.g. *Panicum wrightianum*, *Panicum acuminatum var. uniciphyllum*), found in seed banking studies by Kirkman and Sharitz (1994, pp. 181-183, 185) and Wisheu and Keddy (1991, pp. 184-185).

## Taxonomy:

Hirst Brothers' panic grass was described as the distinct species *Panicum hirstii* by Swallen (1961, p. 235) from a specimen collected in 1958 by Frank Hirst, an active amateur botanist in southern New Jersey. Prior to his death in 2009, Frank Hirst requested that the species' common name be changed from Hirsts' panic grass to Hirst Brothers' panic grass to recognize his brother Robert who discovered the plant with him (McAvoy 2010). Therefore, the species common name (plural possessive) honors both Frank Hirst and his brother Robert Hirst as co-discoverers. According to a taxonomic review conducted by Schuyler (1996, pp. 95-96), the plant had first been collected in 1900 in Sumter County, Georgia and had been "doubtfully" described by Hitchcock and Chase (1910, p. 197) as *Panicum roanokense* Ashe. Others considered the plant to be a variant of *Panicum neuranthum* Griseb (Kral 1983, p. 76) or conspecific with Panicum aciculare Desv. (Gleason and Cronquist 1991, p. 804). In his taxonomic review, Schuyler (1996, pp. 95-96) concurred with the findings of Swallen (1961, p. 235), concluding that *Panicum hirstii* was taxonomically distinct. More recently, systematists have split a group of species from the genus *Panicum* into the genus *Dichanthelium*. In North America, *Dichanthelium* can be recognized easily by the presence of a basal rosette of leaves during the winter and a clear foliar dimorphism (two forms of leaves). This character is not seen in the Central and South American taxa, which led some taxonomists to treat Dichanthelium as a subgenus of Panicum (Aliscioni et al. 2003, p. 797). There is agreement among botanists working with Hirst Brothers' panic grass that *Dichanthelium hirstii* (Swallen) Kartesz is the appropriate nomenclature for the species (LeBlond 2004; Schuyler 2004; Natural Resources Conservation Service 2004). The U.S. Fish and Wildlife Service (Service) accepts the Swallen treatment of the taxonomy. The Service has carefully reviewed the available taxonomic information and has concluded the species is a valid taxon.

## Habitat/Life History:

All known sites of *D. hirstii* are in pine/oak forest and the habitats are variously described as ponds, meadows, or savannas (Schuyler 1998a, p. 2). Ecological communities that support *D. hirstii* in New Jersey and Delaware include the following National Vegetation Classification System (NVCS) types (refer to Walz and Cartica 2010, p. 13).

• Yellow Spikerush (*Eleocharis flavescens*) - Bog Yellow-eyed Grass (*Xyris difformis*) Herbaceous Vegetation

• Virginia Meadowbeauty (*Rhexia virginica*) - Warty Panicgrass (*Panicum verrucosum*) Herbaceous Vegetation

• Smooth Sawgrass (*Cladium mariscoides*) - Wrinkled Jointgrass (*Coelorachis rugosa*) Herbaceous Vegetation

In North Carolina ecological communities that support *D. hirstii* include the following NVCS types (refer to Walz and Cartica 2010, p. 14).

• Pond-cypress (*Taxodium ascendens*) / Maidencane (*Panicum hemitomon*) - Tall Pinebarren Milkwort ( *Polygala cymosa*) Temperate Woodland

• *Taxodium ascendens* / Titi (*Cyrilla racemiflora*) - Honeycups (*Zenobia pulverulenta*) Woodland

• *Taxodium ascendens* / Virginia Chainfern (*Woodwardia virginica*) Woodland

The species requires habitats that are at least intermittently (irregularly) wet, receiving full sun to light shade, and with substrates that are organic but firm (Kral 1983, p. 76; Schuyler 1998a, p. 2). The plant occurs in flat-bottomed depressions with substantial water-level fluctuations dependent on rainfall. The species relies on periods of standing water to keep competing species at a minimum (Schuyler 1998a, p. 2). The pinelands pond systems in which *D. hirstii* is found frequently burn or are burned over during dry cycles and this may be a factor in suppressing competition from woody vegetation (Kral 1983, p. 76).

## Historical Range/Distribution:

The species' historic range included seven sites within New Jersey, Delaware, North Carolina, and Georgia (Schuyler 1996, p. 96). A new site was discovered in New Jersey in 2004 for a total of eight known sites for the species. Of those eight sites, three sites are believed to be extirpated. *Dichanthelium hirstii* has not been observed at the known sites in Sumter and Calhoun Counties, Georgia, for over 30 years and one of the known Atlantic County, New Jersey sites has not been seen since 1992 (NatureServe 2008).

## Current Range Distribution:

*Dichanthelium hirstii* is considered extant at only two sites in New Jersey, one site in Delaware, and two sites in North Carolina. In New Jersey, the two extant sites (two populations) include the Labounsky Pond and Hampton Central Big Pond and are separated by approximately 19 miles. Barkwoods Pond in New Jersey has not had an occurrence of *D. hirstii* since 1992 and may be extirpated.

## Population Estimates/Status:

As described in greater detail below, individual populations can naturally vary dramatically in size from year to year. In some years, plants may not appear (Schuyler 1998a, p. 2).

The known sites on TNC property in Atlantic County, New Jersey, Barkwoods Pond and Labounsky Pond (collectively known as Hirsts' Ponds), are separated by approximately 0.5 miles. Barkwoods Pond is approximately 1.6 acres in size and Labounsky Pond is approximately 5.8 acres in size. The population size of Hirsts' Ponds has fluctuated depending on water levels, with the species being more abundant in dry years. In the late 1950s and early 1960s, there were years in which *D. hirstii* covered large portions of both ponds. Plants were easily found with no or only very little effort. By the 1970s, the species was difficult to find and often absent (Snyder 2010). *Dichanthelium hirstii* was first discovered at the Barkwoods Pond by Frank and Robert Hirst in 1958. The species has not been seen at Barkwoods Pond since 1992 when only nine plants were found after a thorough search. No *D. hirstii* was found in Barkwoods Pond during surveys conducted in

2003, 2007, 2008, 2009, and 2010 (Gordon 2004; Juelg 2004; Walz and Cartica 2008, p. 1; Noe 2010; Snyder 2010; Walz and Cartica 2010, p. 5).

The species was first recorded at Labounsky Pond in 1960 by Frank and Robert Hirst. Two "clumps" (large rhizomatous patches) were observed and photo-documented in 1984. The plant was not found at Labounsky Pond from 1985 to 2001 (Schuyler 1998a, p. 3; Schuyler 2001; Cartica 2005, p. 1; Gordon 2008). Thorough surveys of the Hirsts Ponds were conducted in 2001 with negative results (Schuyler 2001). In June 2002, 1 vegetative plant and 6 fruiting plants with a total of 34 fruiting culms were found (Snyder 2010), representing the first confirmed sighting of the species at this site in 17 years. In July 2003, five *D. hirstii* culms were found at Labounsky Pond (Gordon 2008). A search for the species at Labounsky Pond in 2007 proved negative, but may be attributed to higher water levels in the pond (Walz and Cartica 2008, p. 1; Gordon 2008; Snyder 2010). Searches of the Pond were conducted annually by The Nature Conservancy in 2007 to 2009; no *D. hirstii* plants were found (Noe 2010). Extensive searches at Labounsky Pond were also conducted in June 2010 by the New Jersey Department of Environmental Protection – Office of Natural Lands Management (ONLM) with particular emphasis on areas with previous records, but no D. hirstii plants were found (Walz and Cartica 2010, p. 5).

The Hampton Central Big Pond (also known as Hampton Furnace Pond) site in Wharton State Forest is located in Burlington County, New Jersey, approximately 19 miles northwest of the Hirsts' Ponds in Atlantic County, New Jersey. Hampton Central Big Pond is approximately 2.9 acres in size and the area of the *D. hirstii* in the pond covers 0.25 acres (Walz 2011). In July 2004, at least 28 fruiting culms of *D. hirstii* were documented at this previously unknown site. The site was revisited by ONLM in August 2004 and a total of 131 culms with 114 inflorescences in fruit were observed. Several culms had multiple inflorescences (a flower-cluster of a plant) with a clustered distribution of one to six plants per cluster. During subsequent surveys of Hampton Central Big Pond in 2006, approximately 30 fruiting culms were found (Gordon 2006, p. 63; Gordon 2007; Gordon 2008; Snyder 2010). In September 2007, a complete census of all *D. hirstii* plants was conducted by ONLM and the number of clumps, genets (a group of genetically identical individuals, all originating vegetatively (not sexually) from a single ancestor), ramets (an individual within a genet), culms, inflorescences, and seedlings was recorded. Locations of each plant cluster were mapped using a global positioning system (GPS). A total of 14 plants were documented supporting 161 vernal inflorescences and 152 autumnal inflorescences. Only one plant did not produce flowers (Walz and Cartica 2008, p. 1). In October 2007, additional clumps were discovered by ONLM and mapped with GPS. Details on autumnal (fall) inflorescences were collected (Walz and Cartica 2010, p. 5). In June 2010, the first vernal (spring) inflorescence survey was conducted at Hampton Central Big Pond and 32 clumps (multiple plants each) with 427 vernal inflorescence culms were documented. Surveys were repeated in October 2010 and 303 plants were found with 1,254 culms (average 4 per plant, range 1-83 per plant) and 2,634 autumnal inflorescences (average 9 per plant, range 1-216 per plant) (Walz 2011). Water depth was recorded and all clumps were GPS'd (Walz and Cartica 2010, p. 5). This marks an increase of 12 clumps since 2007-2008 (Walz and Cartica 2010, p. 1). Hydrology analyses conducted from 2007-2009 revealed that the pond surface water level in the Hampton Central Big Pond is not perched or isolated but is the local ground water table. Further analysis concluded that the ground water levels respond rapidly to rain events and that precipitation is driving the local aquifer (Walz and Cartica 2010, p. 6). The duration, timing, and depth of standing water on the pond bottom at known occurrences in New Jersey during the growing season appear to be key factors in the annual presence or absence of the species and may account for dramatic fluctuations in population size (Gordon 2008).

The Assawoman Pond site on State-owned land in Delaware is approximately 2 acres in size (McAvoy 2011). The number of plants counted at the Assawoman Pond site has fluctuated over the period for which surveys have been conducted (1984-2010). *Dichanthelium hirstii* numbers have varied from a low of only 8 plants in 2009 to a maximum of 190 plants counted in 2000. After a low count of only 14 plants in 1990, the species rebounded with 104 plants in 1993 and 190 plants in 2000 (McAvoy 2010). In 2007, a total of 55 individuals were found (McAvoy and Bennett 2007, p. 2). In a June 2009, survey when Assawoman Pond was still flooded, only 3 flowering culms were counted. After an August drawdown, the pond was

re-surveyed and only 8 vegetative plants with no autumnal flowering observed (McAvoy 2010). Survey results have shown that plant numbers are down after wet years (high water throughout most of the growing season) (McAvoy 2010). In 2010, 18 plants were counted (McAvoy 2011). Although the number of plants at the site fluctuates, the Delaware population is believed to be relatively stable or increasing (McAvoy 2004; 2005; 2009; McAvoy and Bennett 2000, p. 4).

The two sites in North Carolina occur on the Camp Lejeune Marine Corps Base. One site, referred to as Lyman Road Cypress Savanna, consists of plants scattered over an area of approximately 25 x 20 meters (82.0 x 65.6 feet (ft)) (Schuyler 1998a, p. 4). Approximately 80-100 *D. hirstii* plants were counted at the Lyman Road Cypress Savanna site in June 1990. The species was confirmed present during surveys conducted in June 1997 and May 2000, but available records do not provide information on the number of plants observed. *Dichanthelium hirstii* was not seen during surveys conducted by North Carolina Natural Heritage Program and Camp Lejeune biologists at the Lyman Road Cypress Savanna site in June 2005, and June and July 2006. Conditions necessary for production of fruiting culms may not have been present in recent years at this site (North Carolina Natural Heritage Program 2008). The last known survey of this site was in 2010 (Walz 2011). There has been no obvious change in habitat, other than the natural yearly fluctuation in site hydrology. Despite the species' absence during the last known survey, the species is still considered extant at the Lyman Road Cypress Savanna site since one of the New Jersey sites showed a decade between *D. hirstii* sightings (Buchanan 2010).

The second Camp Lejeune site, referred to as Starretts Meadow, occurs over an area of about 20 x 15 meters (65.6 x 49.2 ft) (Schuyler 1998a, p. 4). Approximately 28-35 basal rosettes and 150-200 fruiting clumps were counted at the Starretts Meadow site in July 1990 and June 1994, respectively. Several fruiting clumps were observed at the site in May 2000 (LeBlond 2004). No plants were found during a survey at Starretts Meadow site in 2005. Cool dry conditions may have affected the phenology (recurring biological phenomena such as plant budding, especially as influenced by climatic conditions) of the species at the North Carolina sites in 2005. Only 1 clump with 4 fruiting culms was observed during surveys of the Starretts Meadow site conducted in 2006 (North Carolina Natural Heritage Program 2008). The last known survey of this site was in 2010 (Walz 2011).

# Threats

## A. The present or threatened destruction, modification, or curtailment of its habitat or range:

In New Jersey, *D. hirstii* habitat at Labounsky Pond has been impacted by an illegally constructed ditch since the mid to late 1990s. This ditch drains surface water from a construction parking / heavy equipment storage yard into Labounsky Pond. Runoff of oil, fuel, and lubricants from this storage yard poses a threat to water quality within the pond (Eisenhauer 1998; Patt 2000). In the late 1990s at both the Labounsky and Barkwoods ponds in New Jersey, grazing by resident Canada geese (*Branta canadensis*) impacted vegetation in the ponds and fecal matter increased nutrients, contributing to formation of dense algal mats (Schuyler 1998b; Patt 2000). At Labounsky Pond, woody vegetation is encroaching into the portion of the pond inhabited by *D. hirstii*. If not removed, shading by woody vegetation will decrease habitat suitability of the pond for *D. hirstii* (Gordon 2008), because the plants cannot survive in full shade. In 2007, deer browse of much herbaceous vegetation was observed at Barkwoods Pond, but, as no *D. hirstii* plants were observed that year, it is uncertain whether deer browse of *D. hirstii* had occurred (Snyder 2010). A potential new threat to *D. hirstii* at Hampton Central Big Pond is the impact of off-road vehicles. The *D. hirstii* at Hampton Central Big Pond is surrounded by a network of roads (within a few hundred meters) that lead to a nearby area where all the vegetation has been destroyed by illegal off-road vehicle traffic. The roads were created for the purpose of fighting a 1999 wildfire, but quickly became regular thoroughfares for off-road vehicles. Hampton Central Big Pond is accessible to off-road vehicles and is similar to the intermittent ponds that are routinely

used by people who participate in this type recreational activity (Juelg 2011). While there has been no documented damage to *D. hirstii* plants specifically, the damage to surrounding vegetation gives reasonable cause for concern.

In Delaware, encroachment of woody vegetation is an ongoing problem that is actively managed by the Delaware Natural Heritage Program staff (McAvoy 2004; 2008a; 2010). This woody vegetation includes primarily red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), and American persimmon ( *Diospyros virginiana*) (Bennett 1998; McAvoy 2008a). *Carex striata,* a native, but invasive sedge, was documented at Assawoman Pond in Delaware in 1995 and was found to be expanding in 2009 (McAvoy 2010). If not controlled, *C. striata* may outcompete *D. hirstii* within the pond (McAvoy 2007). In 2009, competition with the native, but extremely aggressive, species bog button (*Sclerolepis uniflora*) within Assawoman Pond was identified as a serious threat. Dominance of bog button is believed to be displacing *D. hirstii* within the pond (McAvoy 2010).

Tree cutting, establishment of plow (fire) lines, and encroachment of pond pine (*Pinus serotina*) are immediate threats at the two North Carolina populations (North Carolina Natural Heritage Program 2008). In North Carolina, *D. hirstii* is vulnerable to changes in hydrology, soil disturbance, and canopy clearing. Land management practices such as preparation of plow lines many also directly affect the species local populations by damaging individuals or indirectly adversely affecting habitat by changing hydrology and altering the fire regime (Buchanan 2010). Both North Carolina sites are within areas zoned for military training exercises. The red-cockaded woodpecker (*Picoides borealis*) also occurs at one of the sites in North Carolina. The military has protected this zone for the benefit of the red-cockaded woodpecker and offers some specific protective measures for *D. hirstii*.

## B. Overutilization for commercial, recreational, scientific, or educational purposes:

Not a significant threat to the species.

## C. Disease or predation:

Disease is not a known threat to *D. hirstii*. Instances of deer herbivory is discussed under Factor A above.

## D. The inadequacy of existing regulatory mechanisms:

As explained below, *D. hirstii* has varying levels of state protection throughout its range. *Dichanthelium hirstii* is included on Delaware's rare plant list. The State of Delaware does not have a state endangered species act. The State has a rare plant conservation program. However, no legal protection is given to plants; any protection is strictly voluntary.

*Dichanthelium hirstii* is listed as endangered by the State of New Jersey. However, the New Jersey Endangered Plant List Act does not provide regulatory protection from habitat loss or collection on private lands. It is against State law to collect plant species occurring on state land. Therefore, the Wharton State Forest site is protected from collection. The New Jersey Pinelands Protection Act prohibits development within the Pinelands Area unless it is designed to avoid irreversible adverse impacts on habitats that are critical to the survival of any local populations of federally or State-listed plant or animal species (N.J.A.C. 7:50-6.27 and 6.33). Protections afforded by the Pinelands Protection Act apply only within the "Pinelands Area," specifically that area encompassed by the Pinelands Comprehensive Management Plan. Pinelands regulations require 300-foot wetland buffers (N.J.A.C. 7:50-6.14). All New Jersey *D. hirstii* sites are within the New Jersey Pinelands Area, and therefore afforded protection under the Pinelands Comprehensive Management Plan.

*Dichanthelium hirstii* is listed as endangered by the State of North Carolina. Any person wishing to collect a

listed plant species must have written permission from the property owner as well as a permit from the North Carolina Department of Agriculture's Plant Conservation Program. If species are illegally collected, the penalty is a fine of up to $2,000 per plant collected. However, since both North Carolina sites occur on federal land, D. hirstii is protected against collection. In addition, Camp Lejeune has an Integrated Natural Resources Management Plan (INRMP) that offers some conservation measures for D. hirstii, including avoiding sites during training exercises (Marine Corps Base Camp Lejeune, NC 2006, Appendix D).

Although *D. hirstii* is considered extirpated in Georgia, the species is protected by the state under provisions of the Wildflower Preservation Act of 1973. The species cannot be removed from public land without authorization; a tag is required to transport protected species; and selling protected species is illegal without permission of the landowner.

## E. Other natural or manmade factors affecting its continued existence:

Competition from rhizomatous perennials, particularly *Eleocharis robbinsii*, that dominate the turf covering the pond bottoms, is a threat in Hirst Ponds, New Jersey. Dense growth of *Utricularia fibrosa* and algae may be retarding growth of *D. hirstii* plants at Barkwoods Pond when less water is present (Schuyler 1998a, p. 4). At Assawoman Pond, *D. hirstii* does not occur in areas dominated by dense carpets of *Sclerolepis uniflora*, a native rhizomatous perennial that is a state-rare plant in Delaware. *Sclerolepis uniflora* is quite aggressive at Assawoman Pond and may be out-competing *D. hirstii* at the site (McAvoy 2004; McAvoy 2008b, p.1). Similar observations were made at the Camp Lejeune sites in North Carolina. At one site in North Carolina, where *Utricularia inflata* and algae in the water were present, plants of *D. hirstii* were much smaller than at the other site in North Carolina, which had deeper and clearer water (Schuyler 1998a, p. 4). Given that populations are small and isolated, the vulnerability of the species to the threats mentioned above is exacerbated.

Persistent standing water during the *D. hirstii* growing season was observed to result in high mortality of established plants at the Assawoman Pond site in 2000. In all, 111 plants died at the site between 2000 and 2001. Persistent standing water may prevent all germination and establishment of seedlings (McAvoy and Bennett 2002, p. 3). The duration, timing, and depth of standing water on the pond bottom at known occurrences in New Jersey during the growing season appear to be key factors in the annual presence or absence of the species and may account for dramatic fluctuations in population size. Changes to hydrology at *D. hirstii* habitats significantly impact persistence of the species (Gordon 2008).

## Conservation Measures Planned or Implemented :

The Delaware Division of Fish and Wildlife and Delaware Natural Heritage Program have conducted periodic removal of encroaching native, but invasive, Walter's sedge (also known as straw-colored sedge) (*C. striata*) and woody vegetation at Assawoman Pond. C. striata was effectively managed at the site through 2004 (McAvoy 2004). Ongoing control of *C. striata* is planned by the Delaware Natural Heritage Program (McAvoy 2010). It is presumed that the Delaware Natural Heritage Program will continue to deal with existing and future threats to the species (McAvoy 2010). However, concerns from encroachment by *Acer rubrum* and *Liquidambar styraciflua* and changes to hydrology of the site remain (McAvoy and Bennett 2000, pp. 5-6). In 2005, a small patch of the native, but aggressive *C. striata* was found in Assawoman Pond and had expanded in 2009. If not controlled, competition by *C. striata* could eliminate habitat for *D. hirstii* (McAvoy 2007; 2010).

In November 2004, 55 potted plants of *D. hirstii* were planted in Assawoman Pond by the Delaware Division of Fish and Wildlife and Delaware Natural Heritage Program. These plants originated from seed collected from the site, which were germinated and reared by the Mt. Cuba Center for the Study of Piedmont Flora in Delaware. The plants were randomly placed and planted within sunny open areas of the pond. Each plant was

individually marked and GPS point locations were recorded. Of the 55 plants, 42 were observed to have survived the translocation on the day following planting (McAvoy 2007). In 2006, only 4 of the 55 plants were documented to have survived (McAvoy and Bennett 2007, p. 1). None of the translocated plants have been found since 2006 (McAvoy 2011).

The Marine Corps has cooperated in *D. hirstii* protection efforts in recent years by avoiding activities that would adversely affect the species at the Camp Lejeune, North Carolina sites. One site at Camp Lejeune is within a protected zone maintained for red-cockaded woodpecker (LeBlond 1998). As indicated in the INRMP, *D. hirstii* sites are avoided during training exercises, and a monitoring program, controlled burning, and canopy vegetation management (hand or mechanical) are all conducted at Camp Lejeune (Marine Corps Base Camp Lejeune, NC 2006, Appendix D and p. 5-2).

In New Jersey, The Nature Conservancy (TNC) is working with the construction company near Labounsky Pond to eliminate impacts from the illegally constructed ditch. Active management will be necessary to ensure that impacts are eliminated or minimized. Experimental scarification treatments of the pond bottoms (light to heavy raking of the pond bottom) at Labounsky and Barkwoods Ponds were initiated in 1999, in an attempt to stimulate any naturally occurring seed bank of *D. hirstii* at these sites (Patt 2000). In summer 2003, a small number of *D. hirstii* plants were found at the Labounsky Pond site (Gordon 2004; Juelg 2004). In 2005 through 2007, in a joint effort between TNC, New Jersey Department of Parks and Forestry, and New Jersey Geological Survey, hydrologic monitoring equipment (piezometers and data loggers) was installed at Labounsky and Hampton Central Big Ponds to monitor natural groundwater fluctuations in the ponds and surrounding uplands and relate hydrologic fluctuations to population data (Cartica 2006, pp. 1-2; Cartica 2007, pp. 1-2; Walz and Cartica 2010, pp. 6-7). To address the potential impacts of off-road vehicles to *D. hirstii* at Hampton Central Big Pond, the New Jersey Conservation Foundation is working with Wharton State Forest to arrange a plan to maintain “No Motorized Vehicles” signage in the area and encourage the Wharton State Park conservation officers to regularly patrol the area and enforce the State Park regulations that prohibit driving off of designated roads. Volunteer help is also being organized to help move these conservation efforts forward (Juelg 2011).

Hirst Brothers’ panic grass is not included as a species of conservation concern within State Wildlife Action Plans because the species is a plant and the State plans address wildlife only.

## Summary of Threats :

The major threats to *D. hirstii* are habitat degradation that affects the hydrology of the species’ wetland habitat, competition from rhizomatous perennials, encroachment of woody vegetation, and inadequate regulatory mechanisms to protect this species. Impacts from geese (grazing and nutrient loading), is a minor threat to D. hirstii. Impacts from off-road vehicles, is a new potential threat to *D. hirstii* (at least for the Hampton Central Big Pond population). Given that populations are small and isolated, the vulnerability of the species to the threats mentioned above is exacerbated.

The Service finds that this species is warranted for listing throughout all its range, and, therefore, finds that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

**For species that are being removed from candidate status:**

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

## Recommended Conservation Measures :

• Continue to monitor and manage known *D. hirstii* populations.
• Conduct de novo (over again from the beginning) surveys within suitable coastal plain habitats throughout the species range.
• Continue hydrologic monitoring at Hirsts' and Hampton Central Big Ponds in New Jersey and Assawoman Pond in Delaware; and initiate hydrologic monitoring at the North Carolina sites to correlate changes in hydrology on species abundance and persistence.
• Continue the collaborative effort between New Jersey and Delaware on population and hydrology monitoring methodology and population data analysis.
• Conduct research on species life history.
• Manage encroachment of woody vegetation by controlled burning or hand removal.
• Manage off-road vehicle impacts at Hampton Big Central Pond with assistance of the New Jersey Conservation Foundation and Wharton State Forest and its enforcement officers.

# Priority Table

| Magnitude | Immediacy | Taxonmomy | Priority |
|---|---|---|---|
| **High** | Imminent | Monotypic genus | 1 |
| | | Species | 2 |
| | | Subspecies/Population | 3 |
| | **Non-imminent** | Monotypic genus | 4 |
| | | **Species** | **5** |
| | | Subspecies/Population | 6 |
| Moderate to Low | Imminent | Monotype genus | 7 |
| | | Species | 8 |
| | | Subspecies/Population | 9 |
| | Non-Imminent | Monotype genus | 10 |
| | | Species | 11 |
| | | Subspecies/Population | 12 |

## Rationale for Change in Listing Priority Number:

## Magnitude:

While all five extant *D. hirstii* populations are located on public land or privately-owned conservation lands, threats to the species from encroaching vegetation and fluctuations in climatic conditions are significant and may be exacerbated by anthropomorphic factors occurring adjacent to the species' wetland habitat. Given the low numbers of plants found at each site, even small changes in the species' habitat could result in local extirpation. Loss of any known sites would constitute a significant contraction of the species' range. The small number of populations and their small sizes make this species highly vulnerable.

## Imminence :

While some threats to the species have previously occurred or are currently occurring, the most immediate and severe of these threats (i.e., ditching at Labounsky Pond, encroachment of aggressive vegetative competitors) are in the process of being resolved and are being actively managed in some cases. The success

of these efforts is not yet known at this time, so the threat to the species remains high.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

## Emergency Listing Review

__No__ Is Emergency Listing Warranted?

Based on the best available scientific information, emergency listing is not warranted at this time. Although there are few populations, they are widely scattered such that there is no single threat likely to result in extirpation simultaneously.

## Description of Monitoring:

Information regarding the status of the species is being monitored through annual coordination with New Jersey, Delaware, and North Carolina Natural Heritage Program staff, species experts, and local professional and amateur botanists.

The last comprehensive status survey for the species was conducted in 1998 and included only sites in New Jersey, Delaware, and North Carolina (Schuyler 1998a, p. 1). The historic and rediscovered New Jersey populations are monitored sporadically on a voluntary basis by interested botanists and naturalists. Many of these monitoring efforts go unreported. For example, the Service did not learn until June 2004 that *D. hirstii* had been rediscovered at Labounsky Pond in summer of 2003 by local botanists. The Delaware population is monitored annually by the Delaware Natural Heritage Program. The states of New Jersey and Delaware are now cooperating in an effort to conduct consistent monitoring. In 2009 – 2010, New Jersey and Delaware developed a draft monitoring protocol in an effort to coordinate population and hydrology monitoring methodology and population data analysis. New Jersey added vernal inflorescence monitoring and water depth at each clump to their existing protocol and

Delaware added counts of the number of inflorescences per culm and nodal spouts. The draft protocol includes the following objectives (refer to Walz and Cartica 2010, pp. 8-10).

1. Conduct an annual census of *D. hirstii* at each location.
2. Conduct monthly (June, July, August, and September) population demographic surveys each year.
3. Conduct monthly water level measurement as depth of water at each clump (at time of population sampling).
4. Conduct annual vegetation community monitoring using multiple transects across the pond gradient within the *D. hirstii* population.
5. Conduct a survey of threats to each population noting species encroachment (e.g., *Cladium mariscoides, Carex striata var. brevis*), drought – chlorotic plants, fire, flooding duration – hydroperiod, herbivory, trampling, erosion, sedimentation.
6. Annually take note on dates of anthesis, flower, fruit (vernal and autumnal), and senescence.
7. Annual winter survey for presence of over-wintering basal rosettes.

The North Carolina populations are not regularly monitored. The level of monitoring across the different states is not appropriate to provide an adequate update of the species' current status at this time. Given the low numbers of plants found at only five known locations, loss of any known sites would constitute a significant contraction of the species' range.

**Indicate which State(s) (within the range of the species) provided information or comments on the**

**species or latest species assessment:**

Delaware,New Jersey,North Carolina

**Indicate which State(s) did not provide any information or comment:**

none

## State Coordination:

Georgia did not provide any information or comments.

## Literature Cited:

**REFERENCES**
(* Indicates unpublished reports, submitted manuscripts, other grey literature, or personal communications)

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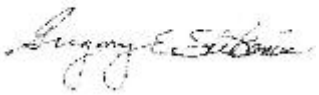
## Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  06/03/2011
Date

Concur:  10/07/2011
Date

Did not concur: _____ _____
Date

Director's Remarks: